TEST REPORT

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TEST SUMMARY

Objective

Assessment of supplied sample to AS4654.1

Project

Evaluation of Fosroc Proofex ORG to AS 4654.1

Report Number

273-1 AS4654.1

Customer

NAME	Parchem Construction Supplies Pty Ltd
ADDRESS	1956 Dandenong Rd Clayton VIC 3168
CONTACT PERSON	Phil Jones
EMAIL	Phil.jones@fosroc.co.nz
MOBILE	+64 21 833216

Name of test material

Fosroc Proofex ORG

Description of test material

Loose laid reinforced TPO Waterproofing membrane

Date of receipt of test material

27/10/2023

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Testing Facility and Location

NAME	XTec Gen Pty Ltd
ADDRESS	30-32 Park Avenue Woodville North 5012
ABN	22634729294

LIMITATION

The test results reported here relate only to the items tested.

CUSTOMER SUPPLIED INFORMATION & DATA

N/A

TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in the *XTecGen Test Request and Sample Submission Form*.

SIGNATORIES

Author

Michael Bakanyozo

Head Laboratory Technician

Reviewer

Eric Scardigno

Laboratory Manager

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SUMMARY OF TESTS

AS4654.1 Requirements:

PROPERTY	METHOD	RESULT	ASSESSMENT CRITERIA	ASSESSMENT
Abrasion Resistance: non-trafficable	*AS 1580.403.2*	***0.024mm***	*AS 4654.1 Paragraph 2.3*	**Meets requirement for non-trafficable membrane**
Abrasion Resistance: trafficable	*AS 1580.403.2*	***0.044mm***	AS 4654.1 Paragraph 2.3	**Meets requirement for occasional, pedestrian and regular foot traffic.**
Dimensional Stability	*ASTM D6207*	***No change in membrane length***	*State result*	
Durability: Control Elongation at Break	*AS 1145.3*	***>1265%***	*AS 4654.1 Appendix A, Table A1*	**CLASS III**
Durability: Control Tensile Strength		***11.18MPa***	*State result*	
Durability: Water Immersion Elongation at Break	*AS 4654.1 Appendix A*	***>1270%***	*AS 4654.1 Appendix A, Table A4*	**PASS**
Durability: Water Immersion Tensile Strength		***13.83MPa***	*State result*	
Durability: Detergent Immersion Elongation at Break		***>1270 %***	*AS 4654.1 Appendix A, Table A4*	**PASS**
Durability: Detergent Immersion Tensile Strength		***13.34MPa***	*State result*	
Durability: Heat Aging Elongation at Break	*N/A*	***1244%***	*AS 4654.1 Appendix A, Table A4*	**PASS**
Durability: Heat Aging Tensile Strength		***11.24MPa***	*State result*	

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Durability: UV Exposure Elongation at Break	*UV Lamp*	***>1269%***	*AS 4654.1 Appendix A, Table A4*	**PASS**
Durability: UV Exposure Tensile Strength		***13.61MPa***	*State result*	[redacted]
Field Seam Strength	*AMTM005*	***306.24N/25mm***	*State result*	
†Puncture Resistance	*BS EN 12691*	***1600mm***	*State result*	
Tear Resistance	*BS EN 12310-1*	***747.70N***	*State result*	
Temperature Resistance	*AMTM004*	***-0.05g/m²/24 hours***	*State result*	
Water Vapour Transmission	*ASTM E96*	***0.02g/m²/24 hours***	*State result*	
†Resistance to Root Penetration	*†PD CEN/TS 14416:2014*	***Root Penetration not observed***	*PD CEN/TS 14416:2014 Paragraph 6*	

†XTec Gen was not NATA accredited at the time of testing

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ABRASION RESISTANCE: NON-TRAFFICABLE

Testing

Test carried out in accordance with AS 1580.403.2.

Additions, deviations and/or exclusions from AS1580.403.2:

Determination of abrasive wear performed as per AS4654.1, Paragraph 2.3.1

Results

Date of test: 13/03/2024

PARAMETER	VALUE
Abrasion assessment method	Depth of abrasion
Abrasive wheels: Model	CS-10
Panel 1 Abrasive wheels: Serial Number & Expiry Date	LR14C1 – JULY 2026
Panel 2 Abrasive wheels: Serial Number & Expiry Date	LR14C1 – JULY 2026
Mass applied to abrasive wheels	1000g
Model of abraser	Gester GT-C14B-2
Number of cycles per test panel	500

PANEL	READING	THICKNESS BEFORE ABRASION (mm)	THICKNESS AFTER ABRASION (mm)	LOSS OF MEMBRANE BUILD (mm)
1	1	4.047	4.047	0.000
	2	4.076	4.037	0.039
	3	4.049	4.045	0.004
2	1	4.110	4.058	0.052
	2	4.058	4.042	0.016
	3	4.073	4.042	0.031
Mean		4.069	4.045	0.024
Standard Deviation		0.016	0.005	0.020

Passing Requirement: "*When tested in accordance with AS 1580.403.2 using the CS-10 wheel with 500 cycles, for areas subjected only to maintenance access, the depth of abrasion shall be less than 0.2mm*"

Result: 0.024mm. This sample is suitable for areas subjected to only maintenance access.

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ABRASION RESISTANCE: TRAFFICABLE

Testing

Test carried out in accordance with AS 1580.403.2.

Additions, deviations and/or exclusions from AS 1580.403.2:

Determination of abrasive wear performed as per AS4654.1, Paragraph 2.3.2

Results

Date of test: 13/03/2024

PARAMETER	VALUE
Abrasion assessment method	Depth of abrasion
Abrasive wheels: Model	H-22
Panel 1 Abrasive wheels: Serial Number	MG25B1
Panel 2 Abrasive wheels: Serial Number	MG25B1
Mass applied to abrasive wheels	1000g
Model of abraser	Gester GT-C14B-2
Number of cycles per test panel	1000

PANEL	READING	THICKNESS BEFORE ABRASION (mm)	THICKNESS AFTER ABRASION (mm)	LOSS OF MEMBRANE BUILD (mm)
1	1	4.116	4.000	0.116
	2	4.040	4.014	0.026
	3	4.056	4.033	0.023
2	1	4.079	4.059	0.020
	2	4.057	4.008	0.049
	3	4.052	4.023	0.029
Mean		4.067	4.023	0.044
Standard Deviation		0.040	0.017	0.037

Passing Requirement:

"Abrasion resistance for trafficable shall be as follows:

a) When tested in accordance with AS 1580.403.2 using the H-22 wheel with 1000 cycles, for areas subjected only to pedestrian traffic, the depth of abrasion shall be less than 0.2mm.

b) When tested in accordance with AS1580.403.2 using the H-22 wheel with 1000 cycles, for areas subjected only to occasional service vehicle traffic, the depth of abrasion shall be less than 0.1mm.

c) When tested in accordance with AS 1580.403.2 using the H-22 wheel with 1000 cycles, for areas subjected to regular foot traffic, the depth of abrasion shall be less than 0.05mm."

Result: 0.044mm. This sample is suitable for occasional service vehicle traffic, pedestrian traffic and regular foot traffic.

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DIMENSIONAL STABILITY

Date of test: 27/11/2023-1/12/2023

Testing:

Testing carried out in accordance with ASTM D6207 "Standard Test Method for Dimensional Stability of Fabrics to Changes in Humidity and Temperature"

Additions, deviations and/or exclusions from ASTM D6207:

Nil

Test Parameters:

PARAMETER	MEASUREMENT INSTRUMENT	
Preconditioning temperature at 24Hrs	32°C	AMTE042A
Precondition humidity at 24Hrs	15%RH	AMTE042A
Method of sampling used	Test Specimens 150 by 1000mm from lengthwise direction and width wise direction of the roll	

MEASUREMENT

			Cycle 1				Cycle 2				
	Initial Pointer Setting	*Date*	*Pointer Reading at 95% RH & 20°C*	*Date*	*Pointer Reading at 15% RH & 32°C*	*Date*	*Pointer Reading at 95% RH & 20°C*	*Date*	*Pointer Reading at 15% RH & 32°C*	*Date*	*sign*
Width wise	805 mm	27/11	805mm	28/11	805 mm	29/11	805mm	30/11	805 mm	1/12	MB
Length wise	805 mm	27/11	805mm	28/11	805 mm	29/11	805mm	30/11	805 mm	1/12	MB

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DURABILITY OF MEMBRANE

CONTROL SET

Date of test: 9/11/2023

Testing: Test carried out in accordance with AS 1145.3.

Additions, deviations and/or exclusions from AS 1145.3: Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	22.7-23.8°C
Ambient humidity (conditioning)	49.8-51.8% RH
Ambient temperature (testing)	23.9°C
Ambient humidity (testing)	41.8% RH
Accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Electronic internal measurement
Method of preparation of specimens	Dry film
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results:

Replicate	Sample thickness (mm)	Maximum Extension (mm)	Tensile Strength (MPa)	Elongation at Break (%)
1	1.50	632.3	11.04	>1265
2	1.50	631.5	9.15	>1263
3	1.50	632.3	9.96	>1265
4	1.50	633.0	11.69	>1266
5	1.55	633.0	14.08	>1266
Mean	1.51	632.4	11.18	>1265
Std Deviation	0.02	0.6	1.89	1

Requirement for Class III (high extensibility): ≥300% elongation at break

Requirement for Class II (medium extensibility) 60-299% elongation at break

Requirement for Class I (low extensibility) <60% elongation at break.

Classification: Class III

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DURABILITY OF MEMBRANE

WATER IMMERSION

Date of test: 24/11/2023-12/01/2024

Testing:

Test carried out in accordance with AS 4654.1 Appendix A.

Additions, deviations and/or exclusions from AS 4654.1 Appendix A:

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	22.7-23.8°C
Ambient humidity (conditioning)	49.8-51.8% RH
Ambient temperature (testing)	23.1-24.7°C
Ambient humidity (testing)	41.2-60.3% RH
Minimum accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Electronic internal measurement
Method of preparation of specimens	Dry film
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results:

Sample Number	Sample thickness (mm)	Maximum Extension (mm)	Tensile strength (MPa)	Elongation at break (%)
1	1.57	653.1	13.75	>1270
2	1.52	653.1	13.96	>1270
3	1.51	635.2	14.37	>1270
7 Day Means	1.53	647.1	14.02	>1270
7 Day Std Devs	0.03	10.3	0.31	0
4	1.52	635.3	13.51	>1271
5	1.51	634.2	13.23	>1268
6	1.51	634.9	13.45	>1270
28 Day Means	1.51	634.8	13.40	>1270
28 Day Std Devs	0.00	0.6	0.15	1
7	1.51	635.6	14.55	>1271

8	1.48	635.3	14.53	>1271
9	1.49	634.5	12.40	>1269
56 Day Means	1.50	635.1	13.83	>1270
56 Day Std Devs	0.01	0.5	1.23	1

Passing Requirement*: "Elongation at break shall not be less than 25% retention of elongation at break of the controls"58] Table 6.1. A failure is for less than 25% retention of elongation at break of the controls".*

To pass this condition an elongation at break value of 317% or greater is required.

Result: >1270% PASS

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DURABILITY OF MEMBRANE

DETERGENT IMMERSION

Date of test: 24/11/2023-12/01/2024

Testing:

Test carried out in accordance with AS 4654.1 Appendix A.

Additions, deviations and/or exclusions from AS 4654.1 Appendix A:

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	22.7-23.8°C
Ambient humidity (conditioning)	49.8-51.8% RH
Ambient temperature (testing)	23.1-24.7°C
Ambient humidity (testing)	41.2-60.3% RH
Minimum accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Electronic internal measurement
Method of preparation of specimens	Dry film
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results: Detergent Immersion

Sample Number	Sample thickness (mm)	Maximum Extension (mm)	Tensile strength (MPa)	Elongation at break (%)
1	1.51	634.7	14.42	>1269
2	1.50	635.3	14.67	>1271
3	1.51	634.3	11.95	>1269
7 Day Means	1.50	634.8	13.68	>1270
7 Day Std Devs	0.00	0.5	1.50	1
4	1.53	635.1	13.83	>1270
5	1.53	633.7	10.20	>1267
6	1.52	635.2	12.83	>1270
28 Day Means	1.53	634.7	12.29	>1269
28 Day Std Devs	0.00	0.8	1.87	2
7	1.55	635.4	14.23	>1271

8	1.56	634.3	11.58	>1269
9	1.49	635.4	14.21	>1271
56 Day Means	1.53	635.0	13.34	>1270
56 Day Std Devs	0.04	0.6	1.52	1

Passing Requirement: *"Elongation at break shall not be less than 25% retention of elongation at break of the controls".*

To pass this condition an elongation at break value of 317% or greater is required.

Result: >1270% PASS

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DURABILITY OF MEMBRANE

HEAT AGING

Date of test: 23/11/2023

Testing:

Test carried out in accordance with AS 4654.1 Appendix A.

Additions, deviations and/or exclusions from AS 4654.1 Appendix A:

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	22.7-23.8°C
Ambient humidity (conditioning)	49.8-51.8% RH
Ambient temperature (testing)	24.8°C
Ambient humidity (testing)	43.6% RH
Accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Electronic internal measurement
Method of preparation of specimens	Dry film
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results:

Number of replicates	Sample thickness (mm)	Maximum Extension (mm)	Tensile strength (MPa)	Elongation at break (%)
1	1.49	635.6	11.38	>1271
2	1.50	635.5	11.47	>1271
3	1.50	594.7	10.86	1189
Mean	1.50	621.9	11.24	1244
Std Deviation	0.01	23.6	0.33	47

Passing Requirement*: "Elongation at break shall be not less than 50% of the result recorded for the controls ".*

To pass this condition an elongation at break value of 633% or greater is required.

Result: 1244% PASS

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DURABILITY OF MEMBRANE

ULTRAVIOLET EXPOSURE

Date of test: 30/01/2024

Testing:

Test carried out in accordance with AS 4654.1 Appendix A.

Additions, deviations and/or exclusions from AS 4654.1 Appendix A:

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	22.7-23.8°C
Ambient humidity (conditioning)	49.8-51.8% RH
Ambient temperature (testing)	24.5°C
Ambient humidity (testing)	53.8% RH
Accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Electronic internal measurement
Method of preparation of specimens	Dry film
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results:

Number of replicates	Sample thickness (mm)	Maximum Extension (mm)	Tensile strength (MPa)	Elongation at break (%)
1	1.49	634.5	14.72	>1269
2	1.51	635.8	14.96	>1272
3	1.51	632.5	11.15	>1265
Mean	1.50	634.3	13.61	>1269
Std Deviation	0.01	1.7	2.14	3

Passing Requirement*: "Elongation at break shall be not less than 40% of the result recorded for the controls ".*

To pass this condition an elongation at break value of 506% or greater is required.

Result: >1269% PASS

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FIELD SEAM STRENGTH

Date of test: 14/03/2024

Testing: Test carried out in accordance with AMTM005.

Additions, deviations and/or exclusions from AMTM005: Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	23.1-24.0°C
Ambient humidity (conditioning)	50.7-63.2% RH
Ambient temperature (testing)	23.3°C
Ambient humidity (testing)	65.7% RH
Elongation measurement type:	Electronic internal measurement
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	100 mm/min

Test Results:

Replicate	Peak Force (N/25mm)	Mode of Failure	
		Lap joint	Sheet
1	325.42	☒	☐
2	338.01	☒	☐
3	254.78	☒	☐
4	313.85	☒	☐
5	299.15	☒	☐
Mean	306.24		
Std Deviation	32.15		
Number of Failures		5	0
% Failure		100	0

Result 306.24 N/25mm

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PUNCTURE RESISTANCE

Date of test: 15/02/2024

Testing:

Test carried out in accordance with BS EN 12691.

Additions, deviations and/or exclusions from BS EN 12691:

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	22.7-23.8°C
Ambient humidity (conditioning)	49.8-51.8% RH
Ambient temperature (testing)	23.1°C
Ambient humidity (testing)	40.7% RH
Method of preparation of specimens	Dry film

Test Results:

RESULT	OUTCOME
Test Method (A or B per BS EN 12691)	Method A
Lowest height of dart released causing greater than 1 of 5 specimens to be punctured	1600 mm
Highest height resulting in less than 2 specimens punctured	2000 mm

NATA WORLD RECOGNISED ACCREDITATION

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TEAR RESISTANCE

Date of test: 9/02/2024

Testing:

Test carried out in accordance with BS EN 12310-1.

Additions, deviations and/or exclusions from BS EN 12310-1:

Nil

Test Parameters:

PARAMETER	VALUE
Test temperature:	23.9°C
Test humidity:	48.5% RH
Conditioning temperature:	22.7-23.8°C
Conditioning humidity:	49.8-51.8% RH
Grip separation speed	100mm/min

Test Results

SAMPLE	THICKNESS (mm)	PEAK FORCE (N)
1	1.466	793.06
2	1.521	711.17
3	1.462	712.23
4	1.478	776.59
5	1.486	745.46
Mean	1.48	747.70
Std Deviation	0.02	37.05

Result 747.70N

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TEMPERATURE RESISTANCE

Date of test: 15/01-29/01/2024

Testing:

Test carried out in accordance with AMTM004.

Additions, deviations and/or exclusions from AMTM004:

Nil

Test Parameters:

PARAMETER	VALUE
Cold exposure: Immersion date	8/01/2024
Cold exposure: Removal date	10/01/2024
Cold exposure: Temperature range	-15.6/-16.4
Heat exposure: Immersion date	10/01/2024
Heat exposure: Removal date	12/01/2024
Heat exposure: temperature range	85°C
WVT: Date of test	15/01-29/01/2024
WVT: Test temperature	23.8-25.0°C
WVT: Test humidity	54.0-63.0% RH
WVT: Cup design	Round, anodised aluminium cup
WVT: Cup sealant	Paraffin wax
WVT: Desiccant	Anhydrous Calcium Chloride

Test Results- Temperature Resistance

SAMPLE	THICKNESS (mm)	SIDE OF SPECIMEN HIGHER VAPOUR PRESSURE WAS APPLIED TO	REGRESSION		WATER VAPOUR TRANSMISSION RATE (g/m^2/24 hours)
			EQUATION	r^2 VALUE	
1	1.48	Side A, top of cast film	$Mass_{(g)}$= 0.000003($Time_{hr}$)+177.03	0.2841	0.02
2	1.48	Side A, top of cast film	$Mass_{(g)}$= 0.000001($Time_{hr}$)+177.27	0.0296	0.01
3	1.48	Side B, bottom of cast film	$Mass_{(g)}$= -0.00003($Time_{hr}$)+178.69	0.7132	-0.22

4	1.48	Side B, bottom of cast film	$Mass_{(g)}$= -0.000003($Time_{hr}$)+178.32	0.1811	-0.02
Mean	1.48				-0.05
Std Deviation	0.00				0.11

Result: -0.05 g/m²/24 hours.

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WATER VAPOUR TRANSMISSION RATE

Date of test: 9/01-23/01/2024

Testing:

Test carried out in accordance with ASTM E96 Desiccant Method.

Additions, deviations and/or exclusions from ASTM E96 Desiccant Method:

Nil

Test Parameters:

PARAMETER	VALUE
Test temperature:	23.9-25.0°C
Test humidity:	54.0-62.6% RH
Cup design:	Round, anodised aluminium cup
Sealant:	Paraffin wax
Desiccant:	Anhydrous Calcium Chloride

Test Results

SAMPLE	THICKNESS (mm)	SIDE OF SPECIMEN HIGHER VAPOUR PRESSURE WAS APPLIED TO	REGRESSION		WATER VAPOUR TRANSMISSON RATE (g/m^2/ 24 hours)
			EQUATION	r^2 VALUE	
1	1.49	Side A, top of cast film	$Mass_{(g)}=0.000007(Time_{hr})+165.92$	0.5133	0.05
2	1.48	Side A, top of cast film	$Mass_{(g)}=0.000002(Time_{hr})+166.62$	0.0176	0.01
3	1.49	Side B, bottom of cast film	$Mass_{(g)}=0.0000005(Time_{hr})+161.25$	0.0014	0.00
4	1.49	Side B, bottom of cast film	$Mass_{(g)}=0.000004(Time_{hr})+188.43$	0.1362	0.03
Mean	1.49				0.02
Std Deviation	0.01				0.02

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Result: 0.02 g/m^2/24 hours.

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ROOT RESISTNACE:

Date of test: 11/01/2024-7/03/2024

Testing:

Testing carried out in accordance with PD CEN/TS 14416:2014

Additions, deviations and/or exclusions from PD CEN/TS 4416:2014:

Nil

Test Parameters:

PARAMETER	VALUE
Growing media	Potting soil
Dimensions of pots: internal top diameter (mm)	240mm
Dimensions of pots: internal bottom diameter (mm)	135mm
Dimensions of pots: height (mm)	220mm
Number of seeds planted	40
Species of seeds	Russel Lupin
Date seeds planted	11/01/2024
Date plants inspected & evaluated	7/03/2024
Duration of cultivation	52 days

Test Results:

TEST RESULT	CONTROL	REPLICATE 1	REPLICATE 2	REPLICATE 3
Number of seeds planted	40	40	40	40
Number of live plants at end of test	26	20	19	24
Maximum length of root development (approx. mm)	200mm	160mm	150mm	200mm
Root penetration observed (Y/N)	Yes	No	No	No

Root penetration of Fosroc Proofex ORG: Images

Replicate 1:

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Showing root development on top of Fosroc Proofex ORG, but no root penetration through barrier.

Replicate 2:

Showing root development on top of Fosroc Proofex ORG, but no root penetration through barrier.

Replicate 3:

Showing root development on top of Fosroc Proofex ORG, but no root penetration through barrier.

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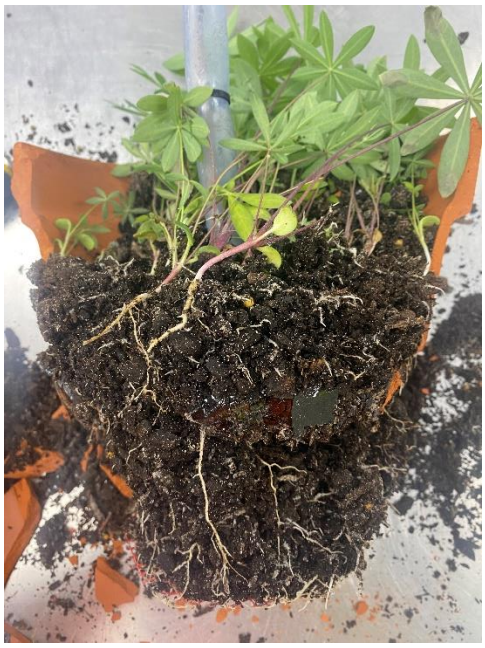
Control:



Showing profile view of control pot with root penetration through to bottom of lower soil level.

Discussion

Control pot showed good germination and root development of germinated plants indicating vitality of the planted seeds to be good.

Pot replicates 1, 2 and 3 all showed good plant germination and root development of germinated plants; however no roots were observed to penetrate through the Fosroc Proofex ORG membrane indicating the barrier to be effective in preventing the root penetration.

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END OF REPORT